

- Gilliard, E.T. (1969). *Birds of Paradise and Bower Birds*. Weidenfeld & Nicolson, London.
- Healey, C.J. (1978). Communal display of Princess Stephanie's *Astrapia Astrapia stephaniae* (Paradisaeidae). *Emu* **78**, 197-200.
- Majnep, I.S. & Bulmer, R. (1977). *Birds of My Kalem County*. Auckland & Oxford Univ. Press, Auckland.
- Manson-Bahr, P.H. (1935). Remarks on the displays of birds of paradise. *Bull. Br. Ornithol. Club* **56**, 63-68.
- Morrison-Scott, T. (1936). Display of *Lophorina superba minor*. *Proc. Zool. Soc. Lond.* **1936**, 809.
- Peckover, W.S. & Filewood, L.W.C. (1976). *Birds of New Guinea and Tropical Australia*. Reed, Sydney.
- Rand, A.L. & Gilliard, E.T. (1967). *Handbook of New Guinea Birds*. Weidenfeld & Nicolson, London.
- Seth-Smith, D. (1936). Remarks on the display of Birds of Paradise. *Proc. Zool. Soc. Lond.* **1936**, 807-808.
- Stonor, C.R. (1940). *Courtship and Display Among Birds*. Country Life, London.
- Timmis, W.H. (1968). Breeding of the Superb Bird of Paradise at Chester Zoo. *Avicult. Mag.* **74**, 170-172.
- Timmis, W.H. (1970). Breeding the Superb bird of paradise *Lophorina superba* at Chester Zoo. *Internat. Zoo Yb.* **10**, 102-104.

A Sexual Difference in the Contact Calls of Silvereyes

PENELOPE J. BRUCE & JIRO KIKKAWA

Department of Zoology, University of Queensland, St Lucia, Qld 4067

Emu **88**, 188-190

Received 21 August 1987, accepted 7 December 1987

Silvereyes *Zosterops lateralis* are known to flock during the non-breeding season (Marples 1944; Kikkawa 1961; Lane 1972). The mechanisms involved in the formation and maintenance of flocks are probably to be found in vocal communication as in flocks of other passerines (e.g. Red-cheeked Cordon Bleu *Uraeginthus bengalus*, Evans & Patterson 1971; Willow Tit *Parus montanus*, Ekman 1979; Strong-billed Honeyeater *Meliphreptus validirostris*, Pizzey 1980). Silvereyes maintain vocal contact whilst feeding and flying and loud calls are particularly common if an individual is separated from the flock. This paper examines the structure and use of these calls and reports on a sexual difference in them.

We have investigated vocal communication among members of winter flocks around Brisbane at Kobbie, Kangaroo Point and Everton Hills, and on Heron Island, where the Capricorn race (*Z. l. chlorocephala*) is resident. Brisbane birds were also studied in captivity. Calls were recorded using a Sony TC-D5 Pro cassette recorder with a Dan Gibson Electronic Parabolic Microphone. Sonograms were made using a Kay Elemetric Sonagraph with FL-1 and narrow band selectors.

On Heron Island, calls were recorded in winter between 13 and 23 June 1985, and 4 and 14 July 1987. Recordings were made of birds on release after trapping or netting them at feeding stations and retaining them in cages for 30 min or longer. Their sexes were known from earlier records of singing (males) and pair relations determined in the

breeding season. Ages ranged from less than one through to nine years.

Sonographic analysis showed three groups of calls that could be recognised in the field by a trained ear. Reliability was tested with tape recordings of 55 calls analysed by sonagraph in June 1985 and likewise confirmed over the next two years. The sexes were not known to the observer when the calls were tested on release.

Twelve Silvereyes caught at Everton Hills on 2 April 1985 were colour banded and transferred to an aviary at the University of Queensland. Before release into the aviary, and on subsequent occasions during the next six months, calls were recorded from these birds both within the aviary and in isolation in a separate room.

Another 12 Silvereyes caught at Kangaroo Point on 14 and 15 June 1986 were colour banded and placed in cages where they were recorded and monitored by ear for a total of 14 h at various times of the day for 12 days. Those birds that gave the 'variable' call were isolated from the others to ensure that other birds using this call were detected. The caged birds were sexed on 26 June 1986 by gonadal examination.

On a banding trip to Kobbie on 13 August 1986, the sex of captured Silvereyes was predicted on the basis of the plumage colour of the flank. Males had a distinct chestnut coloured flank, whereas females were more of an indistinct

light brown (Kikkawa 1963). This plumage difference was reliable in sexing the Kangaroo Point birds. The call type given on release after banding was noted.

Results and discussion

Table 1 presents data collected from all study areas relating the sex of the individual and the call type it used. Three main categories of calls were found based on their distinctive frequency structure (see Fig. 1): the variable call (VC); the linear call (LC); and the short call (SC). The SC was primarily used between flock members and pairs while foraging. Several variations of this soft call were found (Fig. 1). The VC and LC were louder calls used by Silvereyes to establish contact with conspecifics over a greater distance. All three call types were used by both juveniles and adults. The extent of variation found in these calls is shown in Figure 1.

The total results in Table 1 show that call types given are dependent on the sex of the individual. The VC is only used by males in all contexts and in all study areas. The other calls were used by both sexes.

Calls given on release were not independent of sex (log likelihood ratio test: $G = 54.74$, $P < 0.001$) nor were calls given in captivity and in the field ($G = 15.97$, $P < 0.001$).

The greater G value for calls given on release was mainly due to the greater proportion of males that gave the VC in preference to the LC in this context. Table 2 gives the percentages of males and females that used the different call types on release as compared with those used in

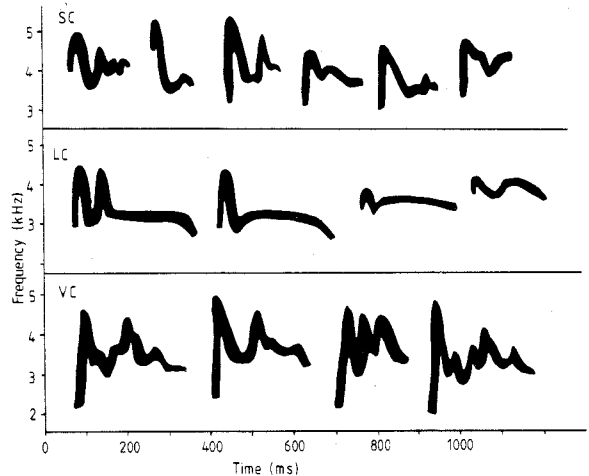


FIGURE 1 A selection of sonograms of Silvereye calls, showing some of the variation found between individuals in the call types. SC = short call, LC = linear call and VC = variable call.

TABLE 1 The number of individuals giving different call types in various contexts in three study areas.

Study area	Context	Date	Determine		Known	Call type			
			Call	Sex		Sex	VC	LC	SC
Heron Is.	Rel.	June '85	S	R	M	13	5	3	20
					F	0	6	1	15
		July '85	E	R	M	3	0	1	12
					F	0	2	2	3
	July '87	S	R	M	23	3	4	9	
				F	0	8	0	6	
	Field	June '85	S	R	M	7	6	7	—
					F	0	3	4	—
July '87		E	R	M	6	1	1	—	
				F	0	1	0	—	
Kangaroo Pt	Cap.	June '86	S	G	M	4	3	2	1
					F	0	5	3	1
Kobble	Rel.	Aug. '86	E	P	M	6	0	0	4
					F	0	5	3	1
Total on release					M	45	8	8	45
					F	0	20	3	29
Grand total					M	62	18	18	46
					F	0	29	10	30

Context: Rel. = release, Cap. = captivity and Field.

Determine Call: Call type determined by sonogram (S) and by ear (E).

Sex: Sex determined by records of pair relations (R), gonadal examination (G) and colour of flank plumage (P).

Known sex: M = male, F = female.

Call type: Variable call (VC), linear call (LC), short call (SC) and no call (NC).

TABLE 2 Percentages of males and females giving different call types on release at Heron Island and Kobbie. For abbreviations see Table 1.

Record	Sex	Call type				No. of birds
		VC	LC	SC	NC	
Release	M	42.5	7.5	7.5	42.5	106
	F	0	38.4	5.8	55.8	52
Field and captivity	M	44.8	26.3	26.3	2.6	38
	F	0	52.9	41.2	5.9	17

captivity and in the field. On release, 42.5% of males gave the VC and 7.5% the LC, whereas in captivity and in the field 44.8% gave the VC and 26.3% the LC.

In the sexually monomorphic Silvereyes, behavioural discrimination of sexes must be important. Vocal discrimination of males is made possible by means of a contact call, namely, the male specific, VC. Although males also used the LC as part of their repertoire, only 7.5% gave this call on release after retention in isolation. The discrimination of these calls by a trained ear in the field can therefore lead to positive identification of males if they use the VC. Females gave the LC call on release more frequently than

the males did, but neither the call structure nor the context in which it was given revealed the sex of the bird.

Acknowledgements

This study was made under permit from the Queensland National Parks and Wildlife Service and supported partly by ARGS grant D1 84/15108. We wish to thank the staff of Heron Island Research Station for their support in this project and Amy Jansen, Bradley Congdon, Rob Elvish, Jenny Elvish and Mike Hines for help in the field.

References

- Ekman, J. (1979). Coherence, composition and territories of winter social groups of the Willow Tit *Parus montanus* and the Crested Tit *P. cristatus*. *Ornis. Scand.* **10**, 56-68.
- Evans, S.M. & Patterson, G.R. (1971). The synchronization of behaviour in flocks of Estrildine finches. *Anim. Behav.* **19**, 429-438.
- Kikkawa, J. (1961). Social behaviour of the White-eye *Zosterops lateralis* in winter flocks. *Ibis* **103a**, 428-442.
- Kikkawa, J. (1963). A sexual difference in the plumage of the Silvereye, *Zosterops lateralis*. *Emu* **63**, 32-34.
- Lane, S.G. (1972). A review of the co-operative Silvereye project. *Aust. Bird Bander* **10**, 3-6.
- Marples, B.J. (1944). Report on trapping and ringing work on the White-eye (*Zosterops lateralis*) throughout the Dominion. *N.Z. Bird Notes* **1**, 41-48.
- Pizzey, G. (1980). *A Field Guide to the Birds of Australia*. Collins, Sydney.

Breeding Biology of the Brown-backed Honeyeater *Ramsayornis modestus* (Meliphagidae) in northern Queensland

WILLIAM J. MAHER

Department of Biology, University of Saskatchewan, Saskatoon, Canada S7N 0W0

Emu **88**, 190-194

Received 1 October 1987, accepted 12 March 1988

The Brown-backed Honeyeater is a small Meliphagid with an average adult weight of 12.1 g (Maher 1986). There is little published information about its life history and general ecology (Miller 1932; Maher 1986). I report on the nest, nest dispersion, breeding biology and nestling survival of the Brown-backed Honeyeater near Townsville, Queensland, latitude 19°15'S.

Study area and methods

The study was carried out in the Townsville Town Common

Environmental Park, chiefly along the Forest Track, but with additional observations on nests along the Waterbird Circuit and the main road. The Forest Track (Fig. 1) is in open *Eucalyptus-Melaleuca* woodland adjacent to a shallow seasonal slough that is a swamp in the rainy season, but was a moist meadow during the study period. Principal woodland trees were paperbarks, primarily *Melaleuca dealbata*, in and along the edge of the slough and a mixed stand of *Eucalyptus* and *Acacias* on the higher ground. Among these the Stocking Gum or Moreton Bay Ash *Eucalyptus tessellaris*, Thick Pod *Acacia crassicaarpa* and *Acacia holoserica* were most abundant. A dense understorey of tall shrubs was dominated by an introduced species, Chinese Apple *Zizyphus mauritania*, and also included White Currant *Securinega melanthesoides* and Sarsaparilla *Alphitonia excelsa*.